

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

In re Application of: **Thomas BEHR, et al.** Examiner: **Alexander P. TAOUSAKIS**

Application No.: **10/573,273**

Group Art Unit: **3726**

Filed: **12/18/2006**

Confirmation No: **9235**

For: **CRANKSHAFT COMPRISING A COMBINED GEAR WHEEL AND METHOD
FOR THE PRODUCTION AND USE OF SAID CRANKSHAFT**

Attorney Docket No: **3926.245**

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P.O. Box 1450
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REPLY BRIEF UNDER 37 C.F.R. §41.39

Sir:

This Reply Brief is being filed in response to the Examiner's Answer mailed August 3, 2011, containing new grounds of rejection. This Reply Brief is being filed in accordance with the requirements of 37 C.F.R. §41.39(b)(2) to maintain the appeal of the rejection of the above-identified patent application. It is not believed that any fee is required for the filing of this Reply Brief under 37 C.F.R. §41.41; however, in the event that any fees are required, the Commissioner is hereby authorized to deduct such fees from Deposit Account No. 16-0877.

STATUS OF THE CLAIMS

All of the claims pending in the subject patent application (claims 4, 5 and 7-14) are under final rejection. Claims 3 and 6 have been withdrawn.

A complete copy of the claims under appeal can be found in the Claims Appendix to the Appellant's Brief filed March 28, 2011.

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether or not claims 4-5, 7-9 and 11-13 are obvious over Hoyes et al (WO 0047362) in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392), under 35 U.S.C. § 103(a);
2. Whether or not claims 10 and 14 are obvious over Hoyes et al (WO 0047362) in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392) as applied to claims 4-5 above, further in view of Kawanami et al (5,409,415), under 35 U.S.C. § 103(a), and

NEW GROUNDS OF REJECTION

3. Whether claims 4-5, 7-9 and 11-13 are obvious over Hoyes et al (WO 0047362) in view of Kolbe et al (2,815,682), Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392), under 35 U.S.C. § 103(a).

ARGUMENT

In response to Appellants explanation of the lack of relevancy of the cited references, the Examiner maintains his position on the grounds that “product-by-process claims are NOT limited to the manipulations of the recited steps, only to the structure implied by the steps. Once a product appearing to be substantially the same or similar is found, a 35 USC 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious difference.” (Examiner Answer, page 5, 9)

The Examiner thus ignores what Appellants argue to be important claim limitations, and interprets the present claims as merely being directed to a crankshaft with combined gear wheel manufactured from tempered ductile iron, which has been subjected to some form of heat treating, wherein at least the gear teeth have a carbide containing coating. (Examiner Answer, page 5, 9)

Appellants maintain that the present claims, properly construed, giving weight to the combination of all claim limitations, clearly define over the prior art.

Appellants have explained, in paragraphs [0008]-[0016] of the specification, and in the Brief on Appeal, how the specific select combination of materials, treatments and process steps produce, in a labor saving manner, an improved crankshaft with combined drive gear wheel. Appellants submit that the Examiner is not considering the most important feature defined by the present claims: the fact that the crankshaft and the gear wheel –two dissimilar parts with dissimilar functions and traditionally formed of dissimilar materials – can be and are cast together quickly and economically as a single piece. The idea that a one-piece casting would have been able to meet both the requirements of the crank shaft and the gear wheel, particularly in a diesel engine which is subject to high stress and high wear, would have been surprising to those working in this art at the time of the present invention. Nothing in the cited references suggests this departure from accepted wisdom.

It is well established that a product-by-process format is the preferred claim format where the invention cannot be easily distinguished from a prior art product in terms of composition and/or structure. See MPEP §2113 “The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding “interbonded by interfusion” to limit

structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations."

In the present case, what better way to distinguish between, on the one hand, the conventional welded or screwed together crank shaft and gear wheel, and on the other hand, the cast together unit, than to recite that the parts are cast together?

Appellants have elected to define the invention in the most convenient and appropriate format. The manufacturing process steps recited in the claims clearly would be expected to impart distinctive structural characteristics to the final product. The Examiner should not be able to ignore claim limitations where Appellants have explained the materiality of the limitations and where the person of ordinary skill would readily accept these explanations.

Accordingly, Applicants request the Board to (a) determine the scope of the present claims, and (b) determine whether the art relied upon by the Examiner, objectively considered, would lead one of ordinary skill to the present invention as claimed.

**CLAIMS 4-5, 7-9 AND 11-13 ARE PATENTABLE OVER HOYES ET AL IN VIEW OF
WILDE ET AL FURTHER IN VIEW OF OYELAYO ET AL**

The limitations of claims 4 and 5 were previously discussed. The present invention is far from the teachings of these references.

Hoyes *forges* (not casts) a crankshaft with a wheel *without teeth* (versus with teeth) and flange. Since the part is forged from SAE 1548 or SAE 1046 *steel* (not tempered ductile iron) and the gear teeth are not formed in the forging step (versus formed in the casting step), the gear teeth must be cut into the gear wheel in a subsequent step. This necessarily precludes that any microstructure treatment imparted to the surface of the teeth for increased friction wear, as by introducing carbide into the melt or application of carbide coatings according to the present invention, remain intact. Further, the labor savings according to the present invention are not suggested in Hoyes.

Further, Hoyes discloses a *uniform* heat treatment of the entire crankshaft (not *local* differential thermal treatment), or induction heating of the gear wheel (apparently *prior* to cutting the gear teeth). Hoyes lacks teaching of the use of the tempered ductile iron (ADI),

lacks teaching of casting, lacks teaching of the integral forming of teeth, lacks teaching of differential increased carbide in the gear teeth. Thus Hoyes is far from the present invention.

Oyelayo discloses plasma treatment (sputtering) as an alternative to heat treatment. This treatment is non-selective, for the entire part. Since sputtering acts on the entire piece, it is not even possible to carry out selective treatment.

The present claims 4 and 5, read in their entirety, provide “wherein crankshaft and gear wheel exhibit *differential hardening*, ... wherein the *hardness of the gear wheel is further increased*” by at least one of (a) local differential thermal treatment during ADI heat treatment and (b) peening, and wherein friction wear resistance is increased by application of carbide containing coatings.

Wilde et al is cited for teaching producing *a crankshaft* out of an austempered ductile iron (see column 2 lines 55-60, where it discloses producing crankshafts, and see column 4 lines 4-12).

Appellants point out that this reference does not suggest that the crankshaft *and the gear wheel*—two dissimilar parts with dissimilar functions and traditionally formed of dissimilar materials—can be and are cast together quickly and economically as a single part.

Regarding Oyelayo plasma treatment (sputtering) a carbide *coating* on gear teeth (see [0029]) as an *alternative* to heat treatment. The Oyelayo treatment is non-selective and is applied to the entire part. There is no way to use the method of Oyelayo to selectively harden only gear teeth.

Turning to claims 7 and 11 (increasing hardness by *local* differential thermal treatment), the Examiner considers that this limitation can be *ignored* as product by process limitation. In response Appellants refer to MPEP §2113, discussed above, providing that the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product.

Wilde et al teaches uniformly dispersing carbides throughout the microstructure of an ADI part to form a part having carbides throughout its thickness (see column 3 lines 66- 67 — column 4 lines 1-12). Thus, the present invention would produce a different product.

Again, the Examiner does not give any weight or significance to the limitation that the gear wheel is hardened by local introduction of carbide. Appellants submit that the claim language should be given a reasonable interpretation. The cited references do not teach

casting a single piece crankshaft and gear wheel, with *local* hardening of the gear wheel part by *local* incorporation of carbide.

**CLAIMS 10 AND 14 ARE PATENTABLE OVER HOYES ET AL IN VIEW OF WILDE
ET AL FURTHER IN VIEW OF OYELAYO ET AL AND FURTHER IN VIEW OF
KAWANAMI**

The Examiner rejects claims 10 and 14 under 35 U.S.C. 103(a) as being obvious over Noyes et al (WO 0047362) in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392) as applied to claims 4 and 5 above, further in view of Kawanami et al (5,409,415). Kawanami et al teaches shot peening a gear wheel to form a shot peened gear wheel (see column 7 lines 56-68 - column 8 lines 1-4).

In response, Appellants submit that these references do not teach the basic invention, namely, that a crankshaft and gear wheel can be cast as a single piece. The present invention represents a radical departure from conventional wisdom, which olds that crankshaft and gear wheel have different functions, and must be made of different materials which are then joined to form the part.

No reference teaches hardening of a gear wheel which is a cast as a unitary part together with the crankshaft, wherein *crankshaft and gear wheel exhibit differential hardening*, wherein both are manufactured from tempered ductile iron (ADI), wherein the *hardness of the gear wheel is further increased by* at least one of (a) local differential thermal treatment during ADI heat treatment and (b) *peening*,

**CLAIMS 4-5, 7-9 AND 11-13 ARE PATENTABLE OVER HOYES ET AL (WO
0047362) IN VIEW OF KOLBE ET AL (2,815,682), WILDE ET AL (6,258,180),
FURTHER IN VIEW OF OYELAYO ET AL (2002/0098392)**

The Examiner newly cites Kolbe et al for teaching that a crankshaft may be cast or forged.

In response, Appellants point out that Kolbe et al teach a crankshaft, but not a combined crankshaft and gear wheel produced in a single casting. See col. 3, line 22.

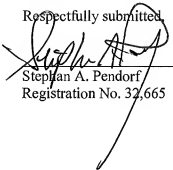
Appellants submit that the Examiner is not considering the most important feature defined by the present claims: the fact that the crankshaft and the gear wheel – two dissimilar parts with dissimilar functions and traditionally formed of dissimilar materials – can be and are cast together quickly and economically as a single piece. The idea that a one-piece casting would have been able to meet both the requirements of the crank shaft and the gear wheel, particularly in a diesel engine which is subject to high stress and high wear, would have been surprising to those working in this art at the time of the present invention. Nothing in the cited references suggests this departure from accepted wisdom.

For the reasons stated herein and provided in the Brief on Appeal filed March 28, 2011, the claims pending in the present patent application are not obvious over the teachings of the cited prior art. It is accordingly appropriate for the Examiner's teachings to be reversed.

Patent Central LLC
1401 Hollywood Blvd.
Hollywood, FL 33020-5237
(954) 922-7315

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Respectfully submitted,



Stephan A. Pendorf
Registration No. 32,665